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COMMONWEALTH OF MASSACHUSETTS BOTTLE BILL REDEMPTION FEE STUDY

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FINAL REPORT
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EXECUTIVE SUMMARY

The Massachusetts Department of Environmental Protection contracted with DSM Environmental Services (DSM) to analyze the financial and environmental benefits and costs of having redemption centers operate in Massachusetts as part of the Massachusetts Bottle Bill. This contract was in response to a directive from the Massachusetts Legislature to the Secretaries of Environmental Affairs and Administration and Finance to:

- study the need for an increase in the handling fee paid to redemption centers;
- evaluate the financial implications of such an increase to the Commonwealth, redemption centers and consumers;
- evaluate the handling fees of other states;
- consider whether distributors should be required to pick up beverage containers from redemption centers or otherwise pay for the charges associated with transportation; and
- report to the House and Senate committees with the study results and make recommendations for reducing the costs of the Bottle Bill system.

DSM conducted detailed cost surveys at 16 redemption centers throughout Massachusetts. DSM also conducted surveys of users of redemption centers and reverse vending machines to determine the characteristics of users of each type of redemption opportunity. Surveys of distributors and bottlers were carried out to assess the impacts associated with raising the container handling fee or requiring pick up of containers. Surveys of retailers were also carried out to determine the costs associated with retail redemption of containers, and especially the costs and usage of reverse vending machines. Finally, discussions were held with manufacturers of reverse vending machines and with bottlers concerning methods to reduce fraudulent redemption through reverse vending machines.

Based on the work performed by DSM under this study, the following conclusions and recommendations are made.

First, DSM's survey of redemption center costs concludes that the average cost per container handled by Massachusetts redemption centers is 2.57 cents. This includes the cost incurred by many redemption centers to deliver empty containers back to distributors. This is above the current handling fee of 2.25 cents. There is a need to address this discrepancy if the Commonwealth wants to continue to support a redemption center system.

Second, based on surveys of users of redemption centers, DSM believes that redemption centers play an important role in increasing the recovery rate for beverage containers. Approximately 39 percent of all beverage containers redeemed in Massachusetts in 1998 were redeemed by redemption centers. In addition, redemption centers serve individuals who collect abandoned containers. Twenty-two percent of these surveyed individuals reported that they would either not collect containers or would throw out their containers if they could not return them to a redemption center.

Third, the lowest cost method for increasing redemption center revenue would be to allow redemption centers to pay less than five cents for returned containers. This approach was supported by many of the stakeholders surveyed, does not result in higher costs to distributors and consumers, and is market based, in that it does not require continual adjustment by the Commonwealth. DSM recognizes that allowing redemption centers to redeem containers for less than five cents reduces the incentive for some individuals to redeem containers. However, the surveys of redemption center users indicate that most users would still redeem containers if offered four cents. This is partially because large users of redemption centers did not pay five cents for the containers to start with. In most cases the containers collected by these large users were originally abandoned by the consumer. It is also important to recognize that consumers still have the option of returning their deposit containers to a retailer and receiving the full five cents even if redemption centers are paying less than five cents.

Fourth, if the Commonwealth finds it necessary to adjust the handling fee in addition to allowing redemption centers to pay less than five cents per redeemed container, the lowest cost option would be to require distributors to pay an increased handling fee to redemption centers of 0.71 cents per container for those containers which are not picked up. This increased handling fee would not have to be paid to retailers because distributors are required to pick up all containers from retailers. DSM estimates that this would have cost distributors approximately 2.2 million dollars in 1998, based on a payment of 0.71 cents per container (which was the average transport cost per container reported by surveyed redemption centers) and an estimated 315 million containers that were transported by redemption centers back to distributors, or distributors' agents.

Fifth, an across-the-board handling fee increase to 2.75 cents appears justified based on reported 1998 redemption center costs. An increase in the handling fee to at least 3 cents appears to be justified based on limited cost data obtained from retailers. However, increasing the handling fee to 2.75 cents for all redeemed containers would increase costs to distributors, and ultimately consumers, by 7.6 million dollars based on 1998 container redemption of 1.51 billion containers. If the handling fee were increased to 3 cents, the additional cost would be 11.25 million dollars. Based on the large number of redeemed containers, the types of fraudulent activities reported to DSM, and handling fees in surrounding states, DSM believes that an across-the-board increase in the handling fee will increase, not decrease, fraudulent activity.

Finally, based on surveys of retailers DSM believes that there will continue to be an increase in the use of reverse vending machines. The inability of these machines to read the indicia (beverage container label that requires 5 cent deposit) provides significant opportunity for fraud. This problem needs to be addressed. While the distributors rightfully argue that this problem should be addressed by the reverse vending machine manufacturers and users, DSM's limited research indicates that the most feasible solution is to change the universal product code.

Additional research is required to determine the cost and feasibility of changing the universal product code on beverage containers sold in the Commonwealth.

INTRODUCTION

Chapter 94 of the Massachusetts General Law, commonly known as the "Bottle Bill", became effective in 1983. It required that all bottlers or distributors of beverages [1] place a five cent deposit on the beverage containers and that this deposit be passed on to the retailer, and ultimately the consumer. The consumer may then return the empty container to a dealer [2] or to a redemption center and collect the five cent deposit.

The Bottle Bill deposit and redemption cycle process can be summarized as follows:

- Bottlers/distributors charge retailers a five-cent deposit on each full beverage container delivered.
- Retailers collect a five-cent deposit from the consumer who purchases the full beverage container.
- Consumer returns empty container to retailers or redemption centers and redeem their five-cent deposit.
- Retailers and redemption centers return empty containers to the bottlers/distributors and collect the five-cent deposit, plus a handling fee of two and a quarter cents per container.

Not all beverage containers are returned by the consumer for redemption of the deposit. Under the amendments to Chapter 94, which became effective in January 1990, all abandoned deposits become property of the Commonwealth.

Up until the amendments to Chapter 94, unclaimed deposits associated with beverage containers not returned to a distributor were kept by the distributor, and were viewed by the distributors as partial compensation for their costs. However, in 1990, Chapter 94 was amended to require that all unclaimed deposits be escheated to the Commonwealth. These escheated deposits, totaling 17.2 million dollars in FY 1997 and 19.8 million dollars in FY 1998 (Massachusetts DEP), are placed in the Clean Environment Fund (CEF). These funds are allocated by statute: (a) not less than 50% for recycling, composting, and solid waste source reduction projects and programs; (b) not less than an additional 20% for recycling and other solid waste projects; and (c) not more than 30% for other environmental programs, and now are an important source of revenue for the Executive Office of Environmental Affairs (EOEA).

Section 323 (c) of the Bottle Bill requires that the distributors pay the dealer (and redemption center) the refund value of the beverage container plus a handling fee of at least one cent per container. Regulations promulgated by the Secretary of the Executive Office of

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[1] Beverage is defined in the Bottle Bill as "soda water or similar carbonated soft drinks, mineral water, and beer and other malt beverages ...".

[2] Dealer is defined as "any person, including any operator of a vending machine, who engages in the sale of beverages in beverage containers to consumers..."

Environmental Affairs (Secretary) in accordance with Section 326 established the initial handling fee at two cents in 1983. It remained at two cents until new regulations were adopted in December 1990, raising the handling fee to 2.25 cents.

Redemption centers have maintained that the current handling fee is insufficient to fully cover their costs associated with handling and transporting the empty containers. In 1998, the Massachusetts Legislature directed the Secretaries of Environmental Affairs and of Administration and Finance:

- To study the need for an increase in the handling fee paid to redemption centers;
- To evaluate the financial implications of such an increase to the Commonwealth, redemption centers and consumers;
- To evaluate the handling fees of other states;
- To consider whether distributors should be required to pick up beverage containers from redemption centers or otherwise pay for the charges associated with transportation; and,
- To report to the House and Senate committees with the study results and make recommendations for reducing the costs of the Bottle Bill system.

The EOEA and Executive Office of Administration and Finance (EOAF), along with DEP, expanded this directive to other issues of concern associated with the Bottle Bill including: the extent of fraudulent redemption; the environmental impacts of redemption centers; the environmental and financial impacts of reverse vending machines; and, the implications of allowing redemption centers to redeem containers for less than five cents. DEP contracted with DSM to conduct the study, with oversight by EOEA and EOAF.

The results of this study may be controversial for at least the following reasons.

First, the Bottle Bill has been opposed since its inception by many retailers, distributors and bottlers, and some consumers who view it as an extra cost to manage a relatively small portion of the waste stream. Conversely, many consumers and environmental groups view the high recovery rate for beverage containers, compared to recovery rates for other recyclable materials, as an example of the success of the Bottle Bill in reducing litter and increasing recycling.

Second, the 1991 amendment to the Bottle Bill escheating unclaimed deposits to the Commonwealth made an already tenuous relationship between distributors and redemption centers even more tenuous, because there were no longer unclaimed deposits to buffer the costs of the Bottle Bill to the bottlers/distributors. This led many distributors to enact more onerous requirements on the redemption centers, including the requirement to transport many empty containers back to central locations instead of being picked up, and the requirement to purchase "mother cartons" and bags for delivery of containers.

Finally, costs associated with the handling fee, while relatively small on a per container basis, are significant given the number of beverage containers sold in Massachusetts. In fiscal year 1996, 1.86 billion beverage containers were sold in Massachusetts (Massachusetts State Auditor's Report, No.98-5050-3). According to the Auditor, 18% of these containers were not returned for deposit, resulting in abandoned deposit revenue for the Clean Environmental Fund of 16.9 million dollars. In addition, the handling fee of 2.25 cents per returned container cost bottlers and distributors, and ultimately consumers, 34.4 million dollars. By calender year 1998 (the most recent data available), 2.17 billion containers were sold and 1.51 billion containers were redeemed (MA DEP), costing distributors/consumers 34 million dollars in handling fees.

SCOPE OF WORK

DSM's contract with MA DEP was divided into the following five tasks as summarized below:

Task 1: Analyze the financial and environmental benefits and costs of having redemption centers operate in Massachusetts.

Task 2: Compare redemption center costs in 1991 to those in 1998.

Task 3: Evaluate the benefits and costs to the various stakeholders of:

- Increasing the handling fee;
- Requiring pickup of empty containers from redemption centers;
- Increasing the handling fee only for containers that are not picked up by distributors;
- Restricting prices that distributors can charge redemption centers for products used to transport containers; and,
- Allowing redemption centers to pay less than five cents for returned containers.

Task 4: Evaluate the impact of fraudulent redemption in Massachusetts on various stakeholders.

Task 5: Prepare a report on the findings.

The following report describes the methods undertaken to complete each task, and the results of DSM's work.

TASK 1: Analysis of the Financial and Environmental Benefits and Costs of Redemption Centers

This task was divided into six sub-tasks:

- Review the literature concerning the environmental benefits of container redemption;
- Conduct a detailed on-site survey of the costs of handling containers at redemption centers;
- Survey the users of redemption centers to determine the characteristics of these users and benefits of redemption centers;
- Conduct a survey of retailers concerning handling costs, the extent of their use of reverse vending machines, and potential impacts of closing redemption centers; and,
- Survey distributors concerning their handling costs, their relationship with redemption centers, and the impact of mandatory pickup.

Based on the redemption activities reported to the DEP by registered redemption centers and retailers data reported to DSM, DSM surveyed redemption centers and retailers that together handled an estimated 32 percent of all containers redeemed in calender year 1998 in the Commonwealth. Table 1 provides DSM's best estimate of redemption activity and the percent of that activity surveyed for this study.

TABLE 1.
Overview of Redemption Activity, by Source, And Percent of Redemption Activity Surveyed by DSM, 1998

Redemption Centers	**Annual Redemption (# containers)**	**% of Total Redemption (%)**	**Percent Surveyed by DSM (%)**
Total Registered (1)	583,789,200	39%	**20%**
"Sole" centers	375,147,300	25%	
Engaged in sales	208,641,900	14%	
Surveyed by DSM	**117,221,256**	**8%**	
Retailers			
Food Store Chains, Estimated Total (2)	600,596,013	40%	**60%**
Surveyed by DSM	**360,357,608**	**24%**	
Convenience Stores/Other Stores (3)	NA	1 - 4%	
Liquor Stores (3) (4)	NA	16 - 20%	
Total Surveyed	**477,578,864**	**32%**	
Total Redeemed in 1998 (5)	**1,510,651,598**	**100%**	**32%**

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(1) Based on 1998 MA DEP registration data which was modified by DSM redemption center surveys.

(2) Estimate based on survey results from food store chains representing 60% of food sales in MA.

(3) Balance of 1998 DOR return data is attributable to liquor stores and convenience stores. The latter are believed to be very small contributors to total redemption and interviewing with stakeholders indicate they contribute between 1 - 4%.

(4) Does not include liquor stores that are registered centers, which are the majority of registered centers that are "engaged in sales". This figure is included above in Redemption Centers. If this figure were included with liquor stores, the estimated % collected through liquor stores would be 32 - 35%.

(5) CY 1998 container return data provided by MA DOR, exclusive of refillable containers.

1) Environmental Benefits of Bottle Bills and the Contribution of Redemption Centers

Placing a deposit on beverage containers has the combined environmental benefits of reducing beverage container litter and increasing the recycling or recovery rate for beverage containers. For example, redemption centers serve users who collect beverage containers from litter. Some of these users report that they would not collect these beverage containers if they could not deliver them to a redemption center (see Section 3, Surveys of Users of Redemption Centers). These benefits are summarized below.

Litter Reduction

There is disagreement in the literature about the actual reduction in litter associated with a deposit on beverage containers. Part of this disagreement stems from the various ways that litter can be measured: by volume, by weight, and by number of pieces. Because beverage containers weigh more than paper and plastic films, measuring litter reduction based on weight yields a significantly different conclusion than measuring litter reduction based on volume or on number of pieces.

There is a general consensus however that beverage container litter is significantly reduced by deposit laws. The Container Recycling Institute (CRI) reports beverage container litter reduction rates ranging from 69 to 83 percent in six bottle bill states[3], although CRI does not cite the source of their data.

A Tellus Institute survey of the literature reports similar reductions, and concludes by stating that "a reasonable summary estimate might be that bottle bills remove 80% of beverage container litter from roadsides and parks."[4]

Recovery Rates

For purposes of this study, "recovery rate" is defined as the percent of beverage containers collected for recycling. For beverage containers with a deposit, this recovery rate can be assumed to be equivalent to the return rate. For curbside recycling programs, the recovery rate is equivalent to the percent of containers generated which are collected for recycling.

Average return rates for deposit bottles in Massachusetts were reported by DOR to be 81 percent during the period of July, 1989 through June, 1997. This can be compared with achievable household recovery rates of 56 percent for curbside recycling programs, and a national average of 39.5 percent for all beverage containers.[5,6] Therefore, the Bottle Bill has significantly increased the recovery rate of beverage containers. This increased recovery rate reduces the environmental impacts associated with producing new glass, aluminum and plastic beverage containers. The Tellus Institute estimates that "a ton of glass recycling saves 2.2 million BTU's (of energy) compared to 163 million BTU's for aluminum and 29 million BTU's for PET... Similarly, glass recycling saves 0.12 metric tons of carbon equivalent (MTCE/ton) greenhouse gas emissions, compared to 3.0 MTCE/ton for aluminum and 0.61 MTCE/ton for PET." [7]

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[3] Container Recycling Institute, "The Ten-Cent Incentive to Recycle", May, 1997, 1400 16th St., NW, Suite #210, Washington, DC 20036.

[4] Tellus Institute, Preliminary Analysis: The Costs and Benefits of Bottle Bills, US EPA Draft Report, January, 1995, p 37.

2) Surveys of Redemption Center Costs

A detailed cost survey was conducted at sixteen redemption centers located throughout the Commonwealth. Redemption centers were targeted for the survey based on the following criteria: willingness to participate and provide detailed cost data; had been in business since 1991 (or at least 5 years); geographic location; border towns to non-bottle bills states; and, urban or suburban locations. Appendix A to this report contains the complete survey questions.

The sixteen redemption centers surveyed represent approximately 9 percent of the 186 centers registered in Massachusetts in 1998 (DEP), and reportedly redeemed approximately 20 percent of the containers redeemed by all registered centers in 1998. The average number of containers redeemed monthly by the surveyed redemption centers (637,000 containers) was higher than the average number of containers redeemed per month by all registered centers (261,600 containers). Fourteen of the surveyed redemption centers were "stand alone" or "sole" centers that either engaged in no retail activity or where retail activity was a minor component of the operation. The other two surveyed redemption centers were registered centers attached to a specific retail activity such as liquor, beer, or soda sales.

The intent of the redemption center survey was to obtain all redemption center costs per month, and then derive per container handling costs by dividing total costs by total containers handled monthly at each redemption center. Individual redemption center costs could then be compared across the same cost categories and judgements made about the quality of the reported costs from each participating redemption center.

Table 2 summarizes average per redemption center costs per container by major cost category for 1998 (see Appendix B for the 1998 detailed cost survey data). Average costs were calculated after throwing out the lowest and highest cost redemption centers and then taking the

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[5] Siegler, T and N Starr, "Sorting Out Recycling Rates", Resource Recycling, May, 1999

[6] US EPA, Characterization of Municipal Solid Waste in the United States: 1997, May, 1998

[7] Tellus Institute, Preliminary Analysis: The Costs and Benefits of Bottle Bills, US EPA, January, 1995, p 49

mean of costs for the remaining 14 redemption centers. The highest and lowest cost redemption centers were eliminated from the sample because they had unique operating conditions that appeared to increase or reduce costs significantly and were not viewed as typical of other redemption centers. This methodology was also used to help account for the fact that all costs were accepted as reported by the redemption centers, without independent verification. However, in all cases, redemption center costs, by category, were compared across all surveyed redemption centers. Wherever certain costs appeared too high or too low compared to the other surveyed redemption centers, follow-up telephone calls were made in an attempt to verify or correct these cost items.

TABLE 2
Average Cost Per Container Handled At Surveyed Massachusetts Redemption Centers, 1998 (1)

MONTHLY HANDLING COSTS	Average Costs Per Center	Average Cost Per Container/Center	% of Total
	($)	($)	(%)
Building Costs	**2,375**	**0.0039**	**15**
Equipment Costs	**464**	**0.0008**	**3**
Operating Costs	**10,258**	**0.0175**	**66**
Labor	8,268	0.0140	53
Bags & Mother Cartons	960	0.0015	6
All Other Operating Costs	1,031	0.0020	7
TOTAL MONTHLY COSTS:	**13,097**	**0.0223**	**84**
Handling Costs Per Container:	***0.0223***		
MONTHLY TRANSPORTATION COSTS			
Truck Costs	1,820	0.0051	
Labor Costs	737	0.0019	
TOTAL MONTHLY TRANSPORT COSTS:	**2,557**	**0.0071**	**16**
Cost Per Container Transported: (2)	***0.0071***		
TOTAL MONTHLY TRANSPORT AND HANDLING COSTS:	**15,654**		
Total Cost Per Container Handled: (3)	***0.0257***		

(1) Numbers may not add due to rounding.
(2) Calculated by dividing total transportation costs by total number of containers transported. Not all containers are transported.
(3) Includes containers picked up and those transported. The average cost per container handled that is transported is 3.28 cents.

As illustrated by Table 2, the average redemption center reportedly incurred per container handling costs of 2.23 cents, ranging from 1.6 to 4 cents, exclusive of costs to transport beverage containers back to the distributor or the distributors agent.

In addition, as illustrated below in Table 3, the average redemption center transported approximately 63 percent of containers collected to a distributor or distributors agent. Average reported per container transport costs were 0.71 cents per container for those containers transported.

TABLE 3
Average Percentage of Containers Transported by Surveyed Massachusetts Redemption Centers, 1998

Average Number of Containers Handled Per Month	**637,031**
# beer containers handled	270,825
# soda containers handled	366,206
Average Number of Containers Transported Per Month	**402,415**
# beer containers transported	223,238
# soda containers transported	179,177
Average Percent of Total Beer and Soda Containers Transported	**63%**
Average percent of beer containers transported	82%
Average percent of soda containers transported	49%

Therefore, the average 1998 handling and transport cost (remembering that not all containers are transported by the redemption centers) is 2.57 cents per container. The average handling and transport cost for just those containers transported is 3.28 cents per container. Both of these costs are higher than the handling fee currently paid to redemption centers of 2.25 cents per container. It should also be noted that the number of containers which must be transported, and total redemption center costs, could increase significantly if the major soft drink distributors were to eliminate pick-up of containers from redemption centers.

Economies of Scale

An attempt was made to evaluate whether larger redemption centers were more cost effective, and therefore, whether the current handling fee was sufficient for the most efficient redemption centers.

Table 4 illustrates that the weighted average handling fee is 2.43 cents per container which is approximately seven percent lower than the average per center cost of 2.57 cents per container. However, this handling cost still exceeds the current handling fee of 2.25 cents.

TABLE 4
Weighted Average Cost per Container Handled, All Surveyed Redemption Centers, 1998

MONTHLY HANDLING COSTS	Total Costs of Centers	Cost Per Container	% of Total(2)
	($)	($)	(%)
Building Costs	**33,248**	**0.0037**	**15%**
Equipment Costs	**6,495**	**0.0007**	**3%**
Operating Costs	***143,615***	***0.0161***	***66%***
Labor	115,747	0.0130	49%
Bags & Mother Cartons	13,440	0.0015	6%
All Other Operating Costs	14,428	0.0016	11%
TOTAL MONTHLY COST:	**183,358**	**0.0206**	**84%**
Handling Costs Per Container:	***0.0206***		
MONTHLY TRANSPORTATION COSTS			
Truck Costs	23,662	0.0049	
Labor Costs	9,584	0.0020	
TOTAL MONTHLY TRANSPORT COSTS: (1)	**33,246**	**0.0069**	**16%**
Cost Per Container Transported:	***0.0069***		
TOTAL MONTHLY TRANSPORT AND HANDLING COSTS:	**216,605**		
Total Cost Per Container Handled: (1)	***0.0243***		

(1) Weighted average cost per container handled that is transported is 0.0274.
(2) Percentages may not add due to rounding.

Table 5 ranks redemption centers by number of containers redeemed per month and compares handling costs only (exclusive of transport costs). As illustrated by the associated scatter diagram, there do appear to be economies of scale, with the largest centers exhibiting lower costs than the smaller centers. However, when transport costs are included, only two redemption centers reported total costs less than the handling fee of 2.25 cents.

TABLE 5
Comparison of Handling Costs, Exclusive of Transport Costs, By Redemption Center Size

# Containers Handled	Handling Cost Per Container (1)
1,500,000	0.0168
1,200,000	0.0146
1,000,000	0.0087
850,000	0.0309
780,000	0.0292
560,000	0.0202
550,000	0.0219
550,000	0.0202
400,000	0.0231
383,333	0.0233
350,000	0.0251
350,000	0.0363
295,105	0.0186
150,000	0.0234

(1) Exclusive of transportation costs.

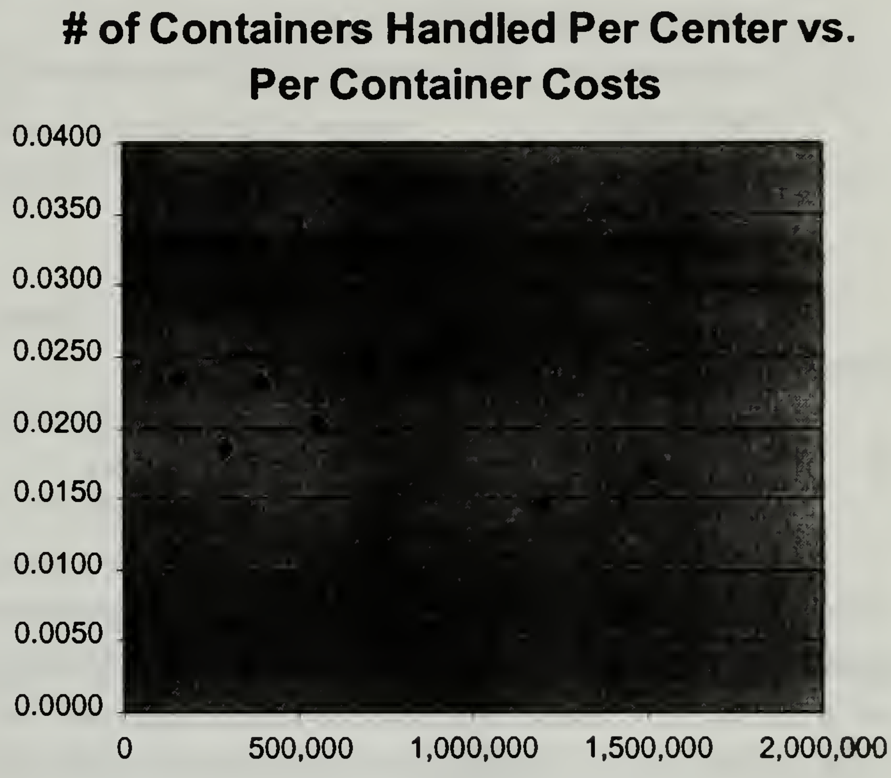

Figure 1

The obvious question then is how do the majority of redemption centers stay in business.

When DSM queried the surveyed redemption centers, their answers included the following:

- collection of containers from bars, restaurants and other large generators with payment of less than the 5 cents per container handling fee;
- spreading costs among other business activities;
- retail sales activity; and,
- payment of less than 5 cents/container for some containers redeemed at the redemption center.

There were also reports (some documented) of fraudulent behavior on the part of some redemption centers that may contribute to added revenues. Reported fraudulent activities included:

- inclusion of non-deposit containers in the containers returned to the distributor;
- "shorting" of cases or bags;
- redemption of containers in the Commonwealth that were purchased in another deposit state; and,
- "re-redemption" or "double redemption" of containers from another deposit state or from within the Commonwealth.

A discussion of potential sources of fraudulent redemption is included in Task 4 of this report.

3) Survey of Users of Redemption Centers

One hundred and sixty-six surveys at six redemption centers were conducted of users of redemption centers. The survey participants represented approximately five percent of the estimated weekly customers at the six centers. Surveys were conducted at four urban and two suburban centers which included two communities that bordered a non-deposit state. The intent of the surveys was to attempt to determine the characteristics of the users of redemption centers and why they chose to use redemption centers instead of retail establishments.

The major survey findings are summarized in Table 6 and included in full in Appendix C. Appendix C also provides a summary of the survey method.

TABLE 6
Summary of Redemption Center Consumer Survey Responses, 1999

1)	**If redemption centers were closed, where would you return deposit containers?**[(1)]	
	Return at supermarket	46%
	Put in recycling bins	18%
	Throw containers away	17%
2)	**Did you travel out of your way to return deposit containers?**	
	Yes	68%
	No	32%
	If Yes, then	
	Average miles out of way	4 miles
	Average minutes out of way	20 minutes
3)	**Average number of containers returned per customer**	1,159 containers/month
4)	**Are the redeemed containers from your home?**	
	Yes	67%
	No	33%
5)	**Would you still redeem containers at this location if it offered 4 cents per container instead of 5 cents?**	
	Yes	87%
	No	13%

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(1) Respondents could choose more than one answer, only the major categories are shown.

It is important to note that while 67 percent of the users reported that the containers were delivered from their homes, redemption center owners reported that the other 33 percent of the users represented approximately 70 percent of total containers returned. This is consistent with the high number of containers reported to be redeemed per month by the average user of 1,159 containers.

Clearly, the larger users are collecting containers from other sources, including places of employment, bars and restaurants, institutions, and from the roadsides and streets. In an effort to determine the characteristics of these large users, surveys of the large users were compiled separately (Table 7). As illustrated in Table 7, this sub-set does not differ significantly from the total surveyed population except that the average number of containers redeemed per month is nearly double the average for the entire group.

TABLE 7
Compilation of Survey Data of Large Users of Redemption Centers Only, 1999 (1)(2)

	Total Respondents	% of Total
If redemption centers were closed, where would you return deposit containers?(3)		
Return at supermarket	28	47%
Throw containers away	10	17%
Put in recycling bin at home	9	15%
Other	10	17%
Not collect containers - leave them where you found them	3	5%
Average number of containers returned per customer/month	2,069	
If containers are not from your home, where did you collect them from?(3)		
"friends... relatives"	19	27%
"roadsides/streets"	17	24%
"workplace"	14	20%
Other	11	15%
"rubbish cans"	10	14%
Would you still redeem containers at this location if it offered 4 cents/container instead of 5 cents?		
Yes	41	79%
No	11	21%
Have you ever used a reverse vending machine?		
Yes	24	45%
No	29	55%
If so, would you prefer use of a reverse vending machines over personal contact?		
No	26	96%
Sometimes	1	4%
Would you recycle these containers if they were not redeemable?		
Yes	30	58%
No	22	42%

(1) Summary of 54 survey respondents answering "no" to the question, "Are the containers you redeem all from your home?"

(2) Not every survey respondent answered every question.

(3) Respondents could choose more than one answer, only the major categories are shown.

It is difficult to determine how many of the containers brought in by the surveyed large users were actually collected from street and roadside litter because the survey asks the user to tell the enumerator where they collect the containers from, instead of the enumerator actually observing where the containers were collected from. However, when asked where the containers come from if not from the home, approximately 20 percent of the respondents stated that containers were collected from streets or roadsides. While no conclusions can be drawn from the surveys about the quantity of containers which would end up as litter if not collected by these redemption center users, it is clear that some users are cleaning up beverage container litter. This would be an area for further research in order to document litter reduction directly attributable to the users of redemption centers.

Another conclusion drawn from the user survey is that many of these users are redeeming containers for income. While no estimates can be made about the contribution to the state economy as a result of this added income, there is clearly an economic benefit to these users.

In addition, if redemption centers were not available, retail establishments would have to accept some percentage of this material, which would place an added burden on the retail establishments. According to the survey of redemption center users, 46 percent would redeem containers at supermarkets if redemption centers were closed.

Finally, and most importantly, these large users contribute to the high recovery rate for deposit containers by collecting containers that in many cases would be abandoned by the consumer. Abandoned containers accounted for 58 percent of the containers returned by large users. Forty-two percent of these large users reported they would not collect these containers if they were not redeemable, and 22 percent stated they would not collect containers if they could not redeem them at redemption centers.

4) Survey of Food Retailers' Handling Costs

Food retailers collect an estimated 39% of containers redeemed in the Commonwealth and therefore play an important role in the container redemption process.

A meeting with members of the Massachusetts Food Association (MFA) was organized to better understand container handling costs experienced by retailers as well as the impacts that specific changes in the bottle bill may have on retail operations. Eight retailers (representing four major grocery store chains) and several members of the MFA were present to discuss handling costs and methods, impact of redemption centers on retailers, and the impact that changes in the bottle bill system would have on retailers.

After the meeting, the MFA assisted DSM in conducting a survey of members to determine the extent of use of reverse vending machines (RVM) and the costs associated with RVM use. The results of the meeting and the subsequent survey are outlined below.

Use of Reverse Vending Machines By Food Retailers

According to retailers, RVMs were first used about 7-9 years ago and their use grew as the cost of machines dropped. While machines now redeem the vast majority of containers at large food stores, handling labor is still required to assist customers for some of the containers that do not go through the machines. Retailers reported that the machines are programmed to handle 99% of the brands distributed. However, many food stores do not have a beer and wine license and therefore do not redeem enough glass bottles to make a glass bottle RVM economical. These glass bottles must then be handled manually at these stores.

Nine major food store chains, representing approximately 60% of 1998 food sales in the Commonwealth (MFA), provided data to the MFA and DSM. As shown in Table 8, 1,263 RVMs are used at 324 food stores operated by the nine chains participating in the survey. These RVMs redeemed over 356 million containers last year. The mean number of containers redeemed per machine per month was 16,787.

The food store chain with the busiest RVMs averaged 30,112 containers per machine per month and the chain with the least active RVMs redeemed an average of 1,352 containers per machine per month.

TABLE 8
Summary of Retailers Use of Reverse Vending Machines, 1998 Data

	Total All Chains	Average Per Chain	Range High	Range Low
Total Containers Redeemed by Surveyed Chains	360,357,508	40,039,723	NA	NA
Total Containers Redeemed Through RVMs	355,874,792	39,541,644	192,000,000	246,460
Percent Redeemed Through RVMs	99%	94%	100%	65%
Containers Redeemed Per RVM/Year	281,769	201,442	361,340	16,224
Containers Redeemed Per RVM/Month	23,481[2]	16,787	30,112	1,352
Number of RVMs In Operation	1,263	140	550	2
Number of Store Locations [1]	324	40	178	1

(1) One retailer did not report the number of locations.
(2) Total containers redeemed through RVMs per month divided by total machines in use at all chains.

Retailers Handling Costs

A total of six retailers provided DSM with a list of the cost categories associated with RVM use. The reported cost categories included:

- RVM lease payments.
- Labor costs to handle containers not accepted by machines (either not programmable or do not scan), pay out receipts off machines (cashier), perform accounting to reconcile bottle chits, unload machines and move containers to storage area, replace paper in machines, call for and oversee service related to machines (clogged machines common), perform general daily sanitation (cleaning in and around machines), and, reprogram machines for new products.
- Pest extermination.
- Loss in sales because of sanitation issues or crowded check out areas.
- Loss of sales space in the store particularly in urban areas where shelf space is costly.
- Cost of backroom storage space.
- Cost of miscellaneous sign work for vending area.
- Electrical costs and one time installation fee.

Complete cost data were provided by only two retailers (Table 9). Because only two retailers provided cost information, Table 9 should be used with caution. However, reported costs for the two retailers for handling redeemable containers are 3.4 and 6.8 cents per container respectively. These costs are significantly greater than the 2.25 cents handling fee.

TABLE 9
Reported Monthly Handling Costs of
Two Massachusetts Food Retailers Using RVMs

	Retailer A	Retailer B
Number of RVMs in Operation	129	23
Average number Containers Redeemed per RVM per month	15,148	14,365
Average Monthly Operating Costs Per Machine		
Lease	$231	$200
Labor	$270	$755
Pest Control	$ 20	$ 22
Total Estimated Costs:	**$521**	**$977**
Cost Per Container:	***$0.034***	***$0.068***

Typical leases available from one RVM leasing company are reported to range from $150 to $250 per month, depending on the volume of returns, with the leasee also paying a fee of between 0.5 and 1.5 cents per container redeemed.

While the costs associated with the use of RVMs appear high, the RVM has addressed one of the largest problems plaguing the container redemption system -- accurate container counts. The RVMs provide an accurate count of containers collected by type and eliminate the risk of double redemption (because the containers are crushed, flattened or shredded). Both help to reduce the opportunity for fraud in the system.

For example, both the food retailers and the Massachusetts Package Stores Association report that RVMs eliminate the opportunity for employee theft from the container return operation. Prior to the use of RVMs, accounting and losses through employee theft were two of the biggest cost areas according to the surveyed retailers. This is because reconciling bottle chits was time consuming and because container accounting methods provided many opportunities for employees to steal from the employer without being caught. The RVMs eliminate employee counts and provide slips directly to customers, eliminating two areas where employee fraud was the greatest.

RVMs also compact or process the scrap material on-site, reducing handling, collection and transport costs starting at the point of redemption. However, RVMs have also introduced another opportunity for fraud into the system by enabling containers that are not purchased in the Commonwealth to be accepted by the machine. This is because RVMs read the bar code and not the deposit stamp. Thus, users can return bottles and cans from non-bottle bill states and receive the deposit amount. This is discussed in detail in Task 4 of this report.

5) Surveys of Users of Reverse Vending Machines

DSM conducted a limited survey of users of RVMs at four different store locations in the Boston metropolitan area. A total of 45 customers were surveyed over four, three hour shifts at the four different stores. Highlights of this limited survey are shown in Table 10 below. Complete survey results are included in Appendix C.

TABLE 10
Summary of Reverse Vending Machine Users Survey Responses, 1999

1)	**Preferred method of returning containers (1)**	
	Reverse vending machine	86%
	Retail store	9%
	Redemption Center	2%
2)	**Is it out of your way to return containers?**	
	Yes	24%
	No	74%
3)	**Average number of miles out of way (2)**	1.6 miles
4)	**Average number of containers returned/customer**	199 containers/month
5)	**Are these containers from home?**	93% Yes
6)	**Do the reverse vending machines accept everything you bring?**	
	Yes	60%
	No	40%
7)	**If not, what percentage do they accept? (Note answers reflect 40% of 45 respondents.)**	
	90% or more	44%
	Less than 10%	16%

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(1) Respondents could choose more than one answer, only the major categories are reported.
(2) Only those that traveled out of their way responded to this question.

Comparison of Redemption Center and RVM Users Survey Findings

Some of the most relevant findings from both the redemption center user survey and the limited surveying done on RVM users are outlined below.

First, travel to redemption centers is an extra trip for the majority of those who redeem containers at redemption centers with 67% of survey respondents going out of their way an average of 4 miles (or 20 minutes) to return containers. In contrast, only 24% of RVM users went out of their way traveling on average an extra 1.6 miles to return containers. There is a cost to the consumer and to the environment associated with this automobile travel. This cost is currently not accounted for in the container redemption system.

Second, the average redemption center user returned 1,159 containers per month, with large users redeeming an average of 2,069 containers per month, while the average RVM user returned only 199 containers per month. These return rates reflect very different types of users. These data indicate that the average redemption center user is an unlikely candidate for RVM use, because of the time it takes to feed RVMs, restrictions on the brands accepted by RVMs, and retail store limits on the number of containers accepted per user per day.

Third, a total of 33% of redemption center survey participants stated that they collected containers from other locations (than just their home) while only 7% of RVM users reported this type of activity.

6) Survey of Distributors

Telephone and in-person interviews were carried out with six distributors to gain an understanding of the costs incurred by distributors associated with the current handling system for deposit containers. Meetings were also held with Massachusetts Wholesalers of Malt Beverages, Inc., and the Massachusetts Food Association. Finally, representatives of the Massachusetts Package Store Association, the Vermont Soft Drink Association, and three distributors in neighboring states were contacted by telephone to discuss distribution and redemption issues.

There are essentially two redemption systems used by distributors. Distributors either operate their own collection and processing system, or they contract with a third party to conduct this operation. The majority of soft drink distributors operate their own system, while the majority of the malt beverage distributors contract with a third party to redeem containers.

Because of the diverse nature of the redemption systems used by those distributors redeeming their own containers, and the reluctance of distributors to provide detailed cost information on their business, it was not possible to develop reliable estimates of per container costs for those distributors collecting their own containers for redemption. However, because many distributors have negotiated similar contracts with an independent contractor which provide for specific per case redemption costs, both for pick up and for processing of delivered containers, per container costs are available for these distributors.

It can be argued that distributors operating their own systems should have lower costs, especially because these distributors can back haul empty containers. There are three primary reasons why this is not necessarily the case. First, in some cases these back haul savings are only partially realized because of per piece incentive contracts for drivers which require the distributors to pay drivers on a per case basis for all cases handled, including returns.

Second, in some cases there are logistical difficulties associated with back hauling empty containers. The generation of empty containers by redemption centers is not necessarily correlated with retail sales of new product by any one distributor. Therefore, especially at the beginning of the day, the loaded truck may have limited room for storage of empties. This then requires that trucks be assigned to service redemption centers at the end of the day, when they are empty, especially for large redemption centers.

Third, distributors may not have the room to efficiently count, sort and process empty containers, requiring a third party for processing even if pick up is provided by the distributor.

Because each distributor is different, the contractually agreed upon prices for pick up and processing of containers established by an independent third party are assumed to be representative of average collection and processing costs for distributors. If these distributors were able to redeem containers at significantly lower costs themselves, they would not have entered into third party contracts.

Distributor Costs For Third Party Redemption

It has been reported that there are variations in the independent redemption contracts. However, contract terms obtained from two distributors were essentially the same, and are summarized below.

TABLE 11
Reported Per Container Contractual Rates For Redeeming Deposit Containers, Net of Commodity Revenue, 1999
(shown in cents per container)

Service Provided	Glass	Cans	Plastic (1)
Pick-up at Redemption Center and Delivery to Processing Center	2.3	1.6	4.4
Delivered to Processing Facility	1.2	1.0	3.0

(1) Based on 2 liter bottles, cost varies by size.

Table 11 can be used to estimate the impact on the distributors associated with a requirement that distributors pick up all containers. Subtracting "delivered" charges from "pick-up" charges yields the estimated cost distributors would have to pay if they were required to provide for collection of all their containers from redemption centers. This cost would be: 1.1 cents for glass; 0.6 cents for aluminum cans; and 1.4 cents for two liter PET bottles.

It should be noted that distributors costs fluctuate with commodity market prices. Because commodity prices are currently at historical lows, average values for the past two years as reported in Recycling Times were used to more accurately reflect longer term commodity prices.

TASK 2: Changes in Handling Costs Since 1991

Nine of the 16 surveyed redemption centers provided detailed information about their costs of operation in 1991. The same survey form was used to determine 1991 costs as was used to determine current (1998) costs. Table 12 summarizes average 1991 costs for the reporting redemption centers and compares these costs to 1998 (current) costs.

TABLE 12
Comparison of Average Per Container Handling Costs of Surveyed Redemption Center Operations in 1991 vs 1998(1)

	1991	1998
Average # of containers handled per month	**435,228**	**637,031**
% beer containers	37%	42%
% soda containers	63%	58%
	Average Costs Per Container in 1991	*Average Costs Per Container in 1998*
MONTHLY HANDLING COSTS AT CENTERS	**($)**	**($)**
Building Costs	**.0023**	**.0039**
Equipment Costs	**.0007**	**.0008**
Operating Costs	**.0162**	**.0175**
Labor	.0128	.0140
Bags & Mother Cartons	.0007	.0015
All other operating costs (2)	.0027	.0020
Handling Costs Per Container:	***.0192***	***.0223***

(1) Does not include transportation costs.

(2) This decrease since 1991 is mostly due to decreased collection of containers from bars and restaurants by redemption centers.

As illustrated by Table 12, redemption center costs were reported to average 1.92 cents per container in 1991. This is less than the average handling cost (without transportation) of redemption centers in 1998. The increase in handling costs are mostly attributable to higher building costs, rising labor costs and the increased cost for mother cartons and bags. These cost increases are outlined in Table 13. More importantly, redemption centers in 1998 had the added cost of transporting an average of 63 percent of their containers back to distributors. This cost redemption centers, on average, 0.71 cents per container that they transported.

TABLE 13
Average Per Container Increase in Costs Since 1991

Cost Category	Cost Increase since 1991 ($ per container handled)	% Cost Increase Since 1991(1)
Transportation	.0071 (2)	NA
Building	.0016	73%
Labor	.0012	10%
Mother Cartons and Bags	.0008	105%

(1) Percentage increase shown on a per container handled basis.
(2) Cost per container transported, not per container handled.

The major increase in costs to redemption centers since 1991 on a per container basis is due to transportation costs. This is because distributors cut back on container collection from redemption centers after 1991 when the escheatage provision was enacted. In 1991, redemption centers transported a very small percentage of container to distributors. In 1998, surveyed redemption centers reported transporting 63%, on average, of containers handled.

The next two highest cost categories (on a per container basis) where increases were seen are building costs and labor. Redemption centers were paying 73% more for leased or owned space as well as for building related costs in 1998. Redemption centers were paying only 10% more for labor, but 0.12 cents per container handled because labor is such a large component of redemption center costs.

The increase in costs for mother cartons and bags is one of the largest increases, on a percent basis, but is one of the smaller categories when calculated on a per container basis at 0.08 cents more per container handled. In 1991, distributors provided cartons to redemption centers free of charge. In addition, distributors were less restrictive about which types of cartons were used for certain brands. Since that time, some distributors have charged $5.00 for a bundle of 25 cartons (or 0.83 cents per container handled in a carton) and $9.95 for a box of specialty plastic bags. While the plastic bags represent little added cost to the container, the cartons do add significant cost to those containers handled using the distributor's mother cartons. However, discussions with redemption centers indicate that most redemption centers have found ways to reduce their purchase of mother cartons so this is not a significant cost compared to their other costs.

TASK 3: Comparison of Options

As illustrated by Table 2, average redemption center costs for handling redeemable containers are greater than the current handling fee established by the Secretary, EOEA. There are redemption centers whose costs are reported to be below the handling fee, and those with reported costs above the handling fee. When transport costs are included for the 63 percent of containers which the redemption centers report delivering to the distributor or the distributors agent, all but two of the redemption centers report costs higher than the handling fee.

Assuming that the cost data reported by the redemption centers are representative of actual costs, there are at least five options available to the Secretary, EOEA. The first is to do nothing. Over time this action will tend to drive the more marginal redemption centers out of business, and create additional pressure on the remaining redemption centers to attempt to generate additional revenue, both legally and fraudulently.

There are those that argue that redemption centers are not necessary. However, based on the user surveys it appears that redemption centers are providing a service that was a basic premise of the original bottle bill. Redemption centers are responsible for redemption of approximately 39 percent of the redeemed containers in the Commonwealth. Users of the redemption centers also contribute to higher return rates for containers, returning containers that in some cases would not be returned without the redemption centers. In addition, there would be increased pressure on retail establishments if redemption centers were not available, and distributors would face higher costs associated with collecting additional containers from retail sales businesses.

Given the premise that redemption centers are necessary, then the question is which alternatives are the least burdensome to the redemption system. Based on DSM's analysis, the alternatives have been ranked in order of preference. The ranking reflects DSM's judgement concerning the best options, although the options are not necessarily mutually exclusive and in some cases could be combined.

1) Allow Redemption Centers to Redeem Containers For Less Than Five Cents

Based on discussions with representatives of all the major stakeholders who must pay or redeem the deposit, it appears that allowing redemption centers to pay less than 5 cents per container is the best option. This is the case despite the recognition that paying less than 5 cents potentially starts the Commonwealth down a slippery slope where the value of deposit containers is significantly diminished and with it the value of returning containers. However, it can be argued that the Commonwealth (as most other states with bottle bills) has already implicitly accepted this policy, given that the initial deposit was set at 5 cents in 1983 and has not been changed since that time to account for inflation.

Under law, retailers cannot redeem containers for less than 5 cents.[8] Therefore, it is likely that redemption for less than 5 cents would be restricted primarily to those redemption centers which needed the additional revenue to maintain a viable business. In most cases, therefore, consumers who paid the 5 cent deposit initially, as well as those collecting abandoned containers, would have the choice of returning containers for the full 5 cents at retail establishments, or could take advantage of the convenience of a redemption center, and redeem their containers for less.

More importantly, surveyed redemption centers reported that approximately 70 percent of the containers redeemed are delivered by customers who are collecting containers from others, and therefore did not initially pay the 5 cent deposit for the container. The consumer of the beverage made the choice to not redeem the container directly, but to either discard the container, or place it in a recycling bin. Similarly, the bars and restaurants who are also supplying these users of the redemption centers have also already made the decision to redeem the container for less to take advantage of the convenience of collection of mixed containers.

Most importantly, allowing redemption centers to redeem for less than 5 cents does not add costs to the significant costs already incurred by distributors and consumers for payment of the 2.25 cents handling fee, as discussed below.

2) Increase the Handling Fee Only For Containers Not Picked Up

The average cost to the redemption centers (in 1998) for transporting containers was 0.71 cents per container transported. If distributors were required to pay an increased handling fee of 0.71 cents for the containers not picked up, or an estimated 315 million containers in 1998, the total costs to distributors and consumers would have been 2.2 million dollars, which is significantly less than the cost associated with increasing the handling fee for all containers.

There are three primary concerns with this approach. First, this approach would still mean that the average redemption center was just barely breaking even under the current handling fee of 2.25 cents. Thus, pressure to increase the handling fee would be renewed again in the near future as inflation increased redemption centers costs.

Second, distributors argue that there is no way for individual distributors to be assured that they are paying for their beverage containers because there are no controls over where the redemption centers collect containers from. By law, distributors are required to accept containers of the size, type, and brand that they have sold in the last 60 days, regardless of whether they sold that actual container. Thus, some distributors will benefit at the expense of other distributors. While this problem already exists, it would be exacerbated by the requirement to pay an increased handling fee for containers that are not picked up. The solution to this problem probably lies in some type of negotiated cost sharing among distributors.

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[8] Redemption centers must also pay 5 cents to redeem all beverage containers from products they sell.

Third, there would need to be a mechanism for periodic review and adjustment of the increased handling fee for these containers. This could continue to be a legislative decision, or the legislature could tie the fee to an index with annual adjustments.

3) Require Distributors to Pick Up or Contract for Pick Up of All Containers

In 1998 approximately 315 million additional containers would have had to have been collected under this alternative. Based on the charges by material type outlined in Table 11, total costs to distributors and consumers would be slightly higher than requiring the distributors to pay a higher handling fee (0.71 cents) for those containers not picked up, ranging between 2.4 and 2.8 million dollars depending on the composition of plastic bottle types.[9]

Similar problems exist for this alternative as for increasing handling fees for containers not picked up as discussed above. In this case, distributors may be picking up containers that are not theirs. In addition, there would be renewed pressure for an increase in the handling fee in the near future as inflation impacts on redemption center costs.

4) Increasing the Handling Fee For All Redeemed Containers

The handling fee would have to be increased to 2.75 cents per container to cover current average Massachusetts redemption center costs plus profit. This increase, ignoring wholesaler and retailer markups, would increase costs to Massachusetts consumers by approximately 7.6 million dollars, based on 1998 container redemptions. If the handling fee were increased to 3 cents, which would be justified based on limited cost data on retailer's handling costs, and which has been discussed by the Legislature, EOEA, and DEP, costs to Massachusetts consumers would increase by approximately 11.3 million dollars, based on 1998 container redemptions.

This increase in costs to consumers, and potential lost sales to non-bottle bill states might be justified if fraudulent activity were also reduced by the increased handling fee. It is recognized that failure to address the actual costs of redemption centers drives some redemption centers to fraudulent activities. However, increasing the handling fee, which will make it higher than in New York and Connecticut, will also increase the incentive for additional fraudulent activity to occur in the Commonwealth. (Appendix E provides current data on deposits and handling fees in the other bottle bill states.) Based on discussions with all of the stakeholders, DSM believes that increasing the handling fee will increase, not decrease fraudulent activity.

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[9] Assuming that beverage containers are 50% aluminum, 30% glass, and 20% plastic bottles

TASK 4: Fraudulent Redemption

As outlined in the Massachusetts State Auditor's Report (No. 98-5050-3), fraudulent redemption can occur at many different points in the Commonwealth's current deposit container redemption system. The last task undertaken by DSM was to investigate where fraudulent redemption is most likely to occur in the current redemption system in the Commonwealth and to identify potential methods to reduce fraud.

It should be noted here that DSM does not represent that it has auditing or legal expertise. Therefore the following information is based solely on reports by various stakeholders, without independent verification by DSM.

Sale of Beverage Containers Stamped With a Deposit Indicia In Non-Bottle Bill States

Consumers may purchase beverages in containers stamped with a deposit without paying the deposit in bordering non-bottle bill states. This is especially the case for soft drinks which are distributed regionally and for some imported beers and microbrewed beers. The State Auditor's report stated that "field tests indicated that... 89% of the containers in Rhode Island and 64% of the containers in New Hampshire were marked as redeemable in Massachusetts" (Report No. 98-5050-3, Executive Summary). DSM visited large and small grocery stores in New Hampshire to observe the practice of selling containers with the MA deposit stamp. Our observations were that roughly 20% of beverage containers present on the shelves and in coolers were marked as redeemable in MA. This is significantly less than the State Auditor's findings, but still represents a significant number of beverage containers that may be returned by:

- Massachusetts residents who buy beverages over the border to save money, or while on vacation in New Hampshire.

- Vacationers, particulary on Cape Cod, who bring beverages with them from non-deposit states and consume them while on their vacation in Massachusetts. One distributor cited return rates of well over 100% for the Cape.

- New Hampshire and Rhode Island recycling program employees who may separate containers with the deposit stamp to raise revenues for the program or themselves. For example, it is reported that Chesterfield, New Hampshire recycling employees separate deposit containers at their recycling drop-off and return them in Vermont for the deposit. Chesterfield's attorney reviewed this practice and found it lawful. Other New Hampshire communities are reported to also separate deposit containers at the recycling centers for redemption in Massachusetts, Maine, or Vermont.

Growing Use of Reverse Vending Machines Which Do Not Read MA Indicia

Roughly 30% of containers redeemed in the Commonwealth are collected through the use of RVMs.[10] Currently, RVMs operate by scanning the container's universal product code (UPC) which is matched to a list of authorized, or programmed, UPC's that are subject to the deposit and approved by the local distributor. The machine will then sort and crush, shred or compact each container in order to destroy the bar-code, increase the storage capacity within the machine, and facilitate transport of the returned container. Once the UPC is scanned, the machine accounts for containers redeemed by brand and eliminates the need for any further counting of containers in the redemption system.

However, the UPC scanner cannot distinguish between a container that originated in a non-bottle bill state from one that was purchased within the Commonwealth because the UPC does not currently include this information. Also, once the container is crushed, shredded or compacted, it is difficult, if not impossible to check for the deposit information.

The number of beer and soda containers that were purchased outside the Commonwealth and fraudulently redeemed through RVMs is difficult to estimate. Sampling done in Manhattan and Rockland County, New York by two major soda distributors found that between 25 and 40% of soda containers and as many as 70 to 75% of beer containers accepted by the sampled RVMs did not have the NY 5 cent indicia on the container. In Michigan, a study sponsored by the Michigan Beer and Wine Wholesalers Association conducted by Michigan Consultants found that approximately 6.7% and 30.5% of containers redeemed through sampled RVMs in southwestern and southeastern Michigan, respectively, did not have the MI 10 cent indicia. However, the Massachusetts State Auditor's report cites an interview with an official from a RVM business in the Commonwealth that stated periodical statistical sampling of cans redeemed in RVMs in areas bordering non-bottle bill states found only 2% of crushed cans sampled did not have the MA 5 cent indicia. DSM was not able to verify this information, and it appears to be inconsistent with reports from New York and Michigan.

Table 14 illustrates potential loss in revenues to the Commonwealth, or Clean Environmental Fund (CEF), and to distributors associated with varying levels of fraudulent redemption through RVMs. Distributors lose money through RVM fraud through both the handling fees reimbursed to retailers and through any fee paid to a third party processor. The range of percentages of non-deposit containers were applied to the estimated 480 million containers redeemed through RVMs in 1998. The estimates in Table 14 do not include fraud through RVMs operated by liquor stores because DSM does not have accurate estimates of use of RVMs by liquor stores.

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[10] DSM's survey of redemption activities by food retailers found that RVM collected 99% of containers handled by the surveyed stores which accounted for 23% of total annual container redemption in MA. Assuming 50% of the food retailers that did not participate in the survey also use reverse vending machines, then approximately 30% of total containers redeemed are through RVMs. This estimate does not include liquor stores whose use of RVM was not surveyed.

TABLE 14
Potential Economic Impact of Fraud through RVMs, 1998

Percent of Non-Indiciad Containers (%)	Containers Redeemed Through RVMs [(1)]	Revenue Lost to CEF ($)	Revenue Lost By Distributors (Handling Fee Only) ($)
2	453,200,000	453,195	203,938
25	453,200,000	5,665,000	2,549,250
30	453,200,000	6,798,000	3,059,100

(1) This estimate is based on DSM survey of food retailers and does not include RVMs used by liquor stores.

RVMs can read an add-on bar code which would reject non-indiciad containers. Bottlers and distributors report that the cost to make the bar code change is high, although more research is necessary to document these costs.[11] In particular, bottlers would be required to create and keep separate inventories of container bodies or labels for the Massachusetts market. Based on discussions with soft drink bottlers/distributors in other states, changing the UPC may be feasible given the fact that it has already occurred in the New York City metropolitan area. However, the beer industry bottlers are not stakeholders in the redemption process because the deposit initiates with the local distributor. Therefore, it would be more difficult to convince beer bottlers to take this step.

Beer distributors surveyed by DSM maintain that RVM manufacturers and users should not be allowed to sell/use machines which can not read the indicia and prevent fraudulent redemption. However, as discussed below, extensive attempts by New York bottlers to create an indicia or other marker that can be consistently read by RVMs have been unsuccessful. Therefore it is likely that changing the UPC is the most feasible solution.

Redemption Centers and Retailers Shorting Bags and Cases

Container counts are perhaps one of the larger labor costs in the redemption system and provide another opportunity for fraud to occur. Some of these costs are felt directly by retailers and redemption centers. Also, there are numerous cases of discrepancies between the redemption center, and even retailers, and distributors about the actual count of containers.

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[11] Conversation with MA Wholesalers of Malt Beverages, March 31, 1999.

Redemption centers may short bags of cans or plastic bottles when collected by, or delivered to, the distributor or distributor's representative. Distributors have documented such practices as filling bags with non-deposit cans when can counting is done, or, filling containers situated in the center of the bag with sand when weighing is practiced instead of counting.

The only estimates DSM was able to obtain of the amount of fraud that occurs through shorting containers was a study by *Michigan Consultants* in 1998. Their sampling efforts found bags of crushed containers averaged 2% to 3% less than the standard agreed on bag count. In addition, according to DEP, the EOEA referred a case to the Attorney General which subsequently found that a redemption center was shorting bags by 7 percent.

Processor and Distributor Fraud

There are at least two other areas where potential fraud can occur in the current redemption system.

First, the double redemption of containers can occur through material processors. Some distributors may use third party processors to process scrap material. If the container is not crushed or shredded by the processor before it is sold, the potential for double redemption exists. While DSM did not hear of documented cases in the Commonwealth, incidents were reported to have occurred in New York State and in Maine. In particular, a MRF in upstate New York was said to have sold truckloads of whole green glass containers to a market which was said to have redeemed the containers downstate.

Second, because there is minimal on-site auditing by the Commonwealth, the potential exists for distributors and bottlers to over-report beverage sales or inflate container return figures to reduce payment of unclaimed deposit money to the DOR. As reviewed in the Massachusetts State Auditor's Report (Report No. 98-5050-3, page 13), the percent of beverage containers returned ranged from 17% to 125% for the reporting period. A total of 14 distributors had return rates of 90% or greater. EOEA and DEP are currently working with DOR on this issue.

Solutions in Other States

Many bottle bill states have had limited incentive to pursue fraudulent redemption cases because the unreclaimed deposits do not return to the state coffers. In Michigan, the only other state with the escheatage provision, 25 percent of the unreclaimed bottle deposits are returned to distributors which has created an incentive for distributors to help reduce fraudulent redemption in the system. While the Michigan bottle bill has strong enforcement provisions, state officials claim that they don't have the resources to enforce them. In addition, the law enables retailers (there are no separate redemption centers) to limit customers to $25 per day for container returns which may help to limit fraud.

Other states also feel that regulations that limit the amount of containers that a customer can return per visit helps to reduce fraudulent redemption. But while Michigan and Massachusetts, for example, have container limits that retail stores can enforce (120 per customer in MA and $25 per day in MI), in reality stores do not want to threaten their customer base. Therefore they are unlikely to enforce this limit unless one customer is inconveniencing other customers by returning large amounts of containers. It is clearly not in the store's best interest to discourage customers from returning large quantities of containers, particulary if the store has RVMs. In the case of RVMs, where the lease rate and per container rate are based on a sliding scale associated with throughput, the greater volume through the machine, the more economical the installation of a machine becomes in the store. Based on the limited cost data collected by DSM on RVM costs, only very high volume machines will pay for themselves through the current handling fee.

In Maine, State officials report a number of cases of fraud, which have been prosecuted (usually with an out-of-court settlement). State officials report that this is primarily the result of the expanded bottle bill, compounded by a higher handling fee. To curb fraud, they have tried to publicize enforcement actions.

In Vermont, state officials have performed spot checks of border stores in New Hampshire to see which brands are being sold in New Hampshire with the VT indicia. Vermont officials have then threatened enforcement action against the distributor because under Vermont law, Vermont can ban sale of the product in Vermont if it is sold in other states with the indicia. While Vermont officials claim some of their enforcement letters have been effective, the practice continues. A recent inspection in a New Hampshire store found an estimated 20% of containers stamped with the VT indicia (Conversation with Cathy Stacy, VT DEC, April 14, 1999).

Finally, New York State has experienced and continues to experience high rates of fraud, particulary along the New Jersey border and in the New York City area. In New York State an estimated two out of every three containers is returned through RVMs which increase the potential for fraud. While state enforcement agencies have been successful at prosecuting fraud, distributors also have been active in identifying where fraud is likely to occur. For example, both Pepsi Cola and Coca Cola Bottling Companies of New York are active in monitoring container return rates by location and following up on unusually high return rates.

In addition, the Pepsi Cola and Coca Cola bottlers in the New York City metropolitan region have made changes to the container UPC to reduce the potential for fraud through RVMs. After researching potential physical changes to the lid, such as a dimple, scratches or even fluorescent markings, Pepsi Cola Bottling Company of New York recently decided that producing a container that allowed a RVM to read the indicia was not feasible, and implemented a deposit specific UPC on their major brands and container types (i.e. 12 ounce cans and 2 liter and 20 ounce bottles). The deposit specific UPC enables the RVM to read the brand and whether there is a deposit on the container enabling the machine to reject all containers of the same brand without the deposit UPC. Two Pepsi Cola Bottling Companies in adjacent territories are said to also be implementing this change as well as the Pepsi Cola bottler that serves the greater Boston area (Conversation with John Kurth, Pepsi Cola, May 4, 1999).

Coca Cola Bottling Company of New York is testing the use of an add-on or supplemental bar code to their major products sold in the metro New York region. RVMs must be programmed to accept these brands with this code. While Coca Cola has taken this step to reduce fraud, the impact of this change on customers, sales and fraud is not yet known.

Conclusions and Recommendations

Based on work performed by DSM under this study, the following conclusions and recommendations are made.

- DSM's survey of redemption center costs concludes that the average cost per container handled by Massachusetts redemption centers was 2.57 cents in 1998. This includes the cost incurred by redemption centers to transport empty containers back to distributors. This is above the current handling fee of 2.25 cents. There is a need to address this discrepancy if the Commonwealth wants to continue to support a redemption center system.

- Based on surveys of users of redemption centers, DSM believes that redemption centers play an important role in increasing the recovery rate for beverage containers by serving individuals who collect abandoned containers. Twenty-two percent of the surveyed large users of redemption centers reported that they would either not collect containers or would throw out their containers if they could not return them to a redemption center.

- The lowest cost method for increasing redemption center revenue would be to allow redemption centers to pay less than five cents for returned containers. This approach was supported by many of the stakeholders surveyed, does not result in higher costs to distributors and consumers, and is market based, in that it does not require continual adjustment by the Commonwealth. DSM recognizes that allowing redemption centers to redeem containers for less than five cents reduces the incentive for some individuals to redeem containers. However, surveys of redemption center users indicate that most users would still redeem containers at four cents. More importantly, the large users of redemption centers did not pay five cents for the containers to start with because in most cases the containers collected by these large users were originally abandoned by the consumer.

- If the Commonwealth finds it necessary to adjust the handling fee, in addition to allowing redemption centers to pay less than 5 cents for redeemed containers, then the lowest cost option would be to require distributors to pay an increased handling fee for those containers which are not picked up. DSM estimates that this would have cost distributors approximately 2.2 million dollars in 1998, based on a payment of 0.71 cents per container. This option would also create an incentive for distributors who are currently picking up containers from redemption centers to continue to do so.

- While a handling fee increase for all containers appears justified based on redemption center and retailer costs, increasing the handling fee to 2.75 cents (sufficient to cover current redemption center costs) would increase costs to distributors, and ultimately consumers, by 7.6 million dollars based on 1998 container redemption of 1.51 billion containers. Increasing the handling fee to three cents, as has been discussed by DEP and EOEA, would cost consumers 11.25 million dollars based on 1998 container redemption. Based on the large number of redeemed containers, the types of fraudulent activities reported to DSM, and handling fees in surrounding states, DSM believes that an increase in the handling fee will increase, not decrease, fraudulent activity.

- Based on surveys of retailers, DSM believes that there will continue to be an increase in the use of reverse vending machines. The inability of these machines to read the indicia provides significant opportunity for fraud. This problem needs to be addressed. While the distributors rightfully argue that this problem should be addressed by the reverse vending machine manufacturers and users, DSM's limited research indicates that the most feasible solution is to change the universal product code. More research needs to be done to document the costs to bottlers and distributors associated with changing the universal product code.

- With the increase in use of RVMs, consumers need to be reminded of the penalties associated with fraudulent redemption. Signs at locations of RVMs warning consumers of the penalties associated with violating the law are a low cost method to reduce fraud among some segments of the population.

- EOEA and DEP should continue to work with DOR to increase the resources needed by DOR to audit distributors' reported sales and returns. Distributors with unrealistically high return rates over a two year period could be targeted in an attempt to reduce fraud.

- The Michigan system, where 25% of the escheatage is shared with the distributors, provides some added incentive for distributors to try to identify, reduce and prevent fraud. This is because fraud reduces escheatage by increasing the number of containers reported to be redeemed. While the CEF would lose revenues under this type of a system, the loss might be partially compensated by a reduction in fraud.

APPENDIX A

Redemption Center Cost Survey

Introduction: DSM has been contracted by Massachusetts Department of Environmental Protection to conduct a state-wide study on the cost of handling deposit containers. Costs are supposed to be gathered from 1991 (the year the handling fee was last increased) and 1998. Responses to this survey will remain confidential, with all data reported in ranges and without reference to redemption center names or locations.

Date of Survey: ____________

Redemption Center Name: ______________________________

Contact Name: ____________________ Phone: ______________

	NOTES	1991	1998
I. Number of containers handled per month			
II. Building Costs			
Size of building		______ sq.ft.	______ sq.ft.
Area of building devoted to handling deposit containers			
Sorting		______ %	______ %
Storage		______ %	______ %
Product Sales		______ %	______ %
Is area leased or owned		______	______
If leased, lease payment		______	______
If owned, loan payment/month		______	______
Electricity costs /month		______	______
Heating costs/ month (average over 12 months)		______	______
Water and sewer costs/month		______	______

Created: February 3, 1999

Redemption Center Name: ______________________

	NOTES	**1991**	**1998**
Property taxes		________	________
Personal property taxes		________	________
Other taxes		________	________
Other building related costs (Explain)		________	________
Alarm System		________	________
Repairs		________	________
III. Equipment costs for collecting sorting and storage			
Moving equipment (list)			
Forklift(s)		________	________
Hours used/month		________	________
If owned: year purchased:		________	________
purchased price:		________	________
If leased: monthly lease payment		________	________
Truck(s)			
Year purchased:		________	________
Purchased price:		________	________
Hours used per month		________	________
Other			
Pallet Jacks		________	________
Other		________	________

Redemption Center Name: ______________________

	NOTES	1991	1998
Stationary Equipment			
Estimated value of office equipment (furniture, fax, cash register)		________	________
Estimated value of computer(s)		________	________
Telephone cost/month		________	________

IV. Operating Costs

	1991			1998		
Labor (except delivery of containers)	#	$/hr	Total Monthly Wages	#	$/hr	Total Monthly Wages
Administrative / Office						
Sorting						
Equipment Operators						
Collection						
Sales						

	NOTES	1991	1998
Overhead			
Worker's Compensation Insurance (monthly)		________	________
Social Security/Medicare (monthly)		________	________
Other Benefits			
Equipment Maintenance / Operation			
Fuel costs (gallons/month ________)		________	________

Redemption Center Name: ____________________

	NOTES	1991	1998
Maintenance cost		________	________
Short term rental		________	________
Bag & Mother Carton Cost		________	________
Plastic Bags		________	________
Mother Cartons From Distributors		________	________
Other Cartons		________	________
Tape		________	________
Markers		________	________
Other Costs		________	________
Office Supplies		________	________
Employee Supplies (e.g., uniforms, eye/ear protection, gloves, toilet supplies)		________	________
Pest Extermination		________	________
Waste Disposal		________	________
Liability / Fire Insurance		________	________
Accounting Costs		________	________
Payroll Payment (if using an outside firm)		________	________
MA Income Tax for corporation		________	________
Federal Income Tax for corporation		________	________

Redemption Center Name: ______________________

	NOTES	1991	1998
V. Transport Costs			
What percent of soda containers do you deliver?		________	________
List delivery locations (e.g., TOMRA, etc.)		________	________
Who picks up? List		________	________
What percent of beer containers do you deliver?		________	________
List delivery locations		________	________
Who picks up? List		________	________
If transport using your truck:			
Truck costs cost/mile		________	________
miles/month		________	________
Labor cost/month		________	________
If hire:			
Monthly charge (cost/mile)		________	________
miles/month		________	________
Other		________	________

Redemption Center Name: ________________	**NOTES**	**1991**	**1998**
General Information			
Year Began as Operator		________________	
Percent of Gross Income From Redemption vs. Sales		______ %	______ %
Percent Beer Containers Redeemed vs. Soda		______ %	______ %
Hours of Operation/ week		______	______
Number of Customers / week		______	______
What Percent Collect Containers for Income		______ %	______ %
What Percent of Containers Delivered for Income		______ %	______ %
Do you pay 4 or 5 cents for containers?		______	______
If you collect?		______	______
If delivered?		______	______
What percentage of containers do you think are from out-of-state?		______ %	______ %
Have you considered installing reverse vending machines?		______	______
If not, why?		______	______

Created: February 4, 1999

APPENDIX B

Redemption Center Costs 1991 & 1998

REDEMPTION CENTER COSTS (1991)

Average Monthly Costs of Surveyed Redemption Centers

Identification	3	4	5	7	8	11	12	14	15 (1)	Total Costs	Average Costs/ Center	*% of Total Cost*
Location	*Suburban*	*Suburban*	*Urban*	*Suburban*	*Suburban*	*Urban*	*Urban*	*Suburban*	*Suburban*			
# of containers handled/month	383,333	350,000	400,000	500,000	158,722	1,200,000	150,000	275,000	500,000	3,917,055	435,228	
% beer containers	30%	50%	50%	40%	50%	52%	25%	20%	15%	3	37%	
% soda containers	70%	50%	50%	60%	50%	48%	75%	80%	85%	6	63%	
HANDLING COSTS AT CENTERS												
Building Costs												
Building Size (square feet)	20,000	6,200	7,000	2,400	2,000	10,000	1,360	15,000	2,000	65,960	7,329	
Area devoted to containers	10%	60%	72%	95%	100%	99%	100%	100%	100%	7	82%	
Area devoted to sorting	5%	24%	39%	28%		15%	29%	70%	50%	3	29%	
Area devoted to storage	5%	35%	33%	67%		84%	71%	30%	50%	4	42%	
Area devoted to product sales	90%	40%	28%	5%		1%						
Lease or owned	Owned	Leased	Leased	Leased	Leased	Leased	Leased	Leased	Leased		NA	
Lease or mortgage payment/mo.	700	690	1728	950	125	2,440	150	Donated	500	7,283	809	
Electricity cost/month	250	100	0	158.3333	82.81	211	30	Included	35	867	96	
Heating costs/month	150	30	Included	Included	50	128	50	Included	50	458	51	
Water and sewer costs/month	200	Included	Included	Included	NA	NA		Included	Included	200	22	
Property taxes	Included	NA	NA	NA	NA	NA	NA	NA	NA	0	0	
Other building related costs												
Alarm systems	200	45		NA			20		20	285	32	
Repairs	83	50	0	NA			17		75	225	25	
Subtotal:	*$1,583*	*$914*	*$1,728*	*$1,108*	*$258*	*$2,779*	*$267*	*$0*	*$680*	*$9,317*	*$1,035*	13%
Cost per container:	*0.0041*	*0.0026*	*0.0043*	*0.0022*	*0.0016*	*0.0023*	*0.0018*	*0.0000*	*0.0014*	*0.0024*	0.0023	
Equipment Costs												
Moving equipment												
Forklift (8 years unless noted)	0	0		2	21				50	73	8	
Truck	0	200	42	190	410	Included				841	93	
Pallet Jack(s) - Electric	14	0		13		200				226	25	
Pallet Jack(s) - Hand (6 years)			12					8	7	27	3	
Storage trailer	50	0	0	0						50	6	
Stationary Equipment				23						23	3	
Office equipment (3 years)	14	0	10		4	4		56		88	10	
Computer	17	0		42	0			28		86	10	
Telephone costs per month	50	88	65	33	20		20	40		316	35	
Subtotal:	*$144*	*$288*	*$128*	*$302*	*$455*	*$204*	*$20*	*$132*	*$57*	*$1,730*	*$192*	2%
Operating Costs												
Administrative	430	100	800				20		1600	2,950	328	
Labor	3,870	3,491	3,000	4,750	1,615	4173	1320	7,102	5,440	34,761	3,862	
Overhead												
Worker's Compensation	387	139	500			1200	3.744	0		2,230	248	
Social security/Medicare	Included	292	600	367		660	198	58	1,044	3,218	358	
Benefits	581	0	0							581	65	
Equipment Maintenance						8800				8,800	978	
Fuel costs	0		75		36			200		311	35	
Maintenance	0		120	42	333			83		579	64	
Bags & Mother Cartons								111		111	12	
Plastic bags	215	258		300	49				900	1,722	191	
Mother cartons from distributors	0	323				67	50		50	490	54	
Tape, Markers		10	60			20	9		15	114	13	
Shrink Wrap	86		80			Included	3		30	199	22	
Other Costs							20			20	2	
Office Supplies	10		20		13			116		159	18	
Employee supplies (gloves, glas:	30	15	130		35	8	15	above	100	333	37	
Pest extermination	25	20	50	0	24	8	10	in lease	10	147	16	
Waste Disposal	50	110	150	0		292	125	in lease	75	802	89	
Liability/Fire Insurance	83	63	0			129	33	NA	50	359	40	
Accounting Costs	21	30	300	72	63		100	1,050	500	2,135	237	
Payroll costs	43	25	75					116	0	259	29	
MA & Federal Income Tax corpo.	0	26	0					NA		26	3	
Unredeemable containers	0	0	40	0						40	4	
Subtotal:	$5,831	$4,902	$6,000	$5,531	$2,167	$15,357	$1,907	$8,836	$9,814	$60,344	6,705	85%
Total Monthly Costs	**$7,558**	**$6,105**	**$7,856**	**$6,942**	**$2,880**	**$18,340**	**$2,193**	**$8,967**	**$10,550**	**$71,392**	**$7,932**	**100%**
Handling Costs/Container:	**0.020**	**0.017**	**0.020**	**0.014**	**0.018**	**0.015**	**0.015**	**0.033**	**0.021**	**0.018**	0.0192	

(1) Costs are from 1993 instead of 1991.

REDEMPTION CENTER COSTS (1998)

Average Monthly Costs of Surveyed Redemption Centers

Identification	2	3	4	5	6	7	8	10	11	12	13	14	15	16	Total	Average Costs Per	Percentage of Total	
Location	*Urban*	*Suburban*	*Suburban*	*Urban*	*Urban*	*Suburban*	*Suburban*	*Urban*	*Urban*	*Urban*	*Urban*	*Suburban*	*Suburban*	*Suburban*	Costs	Center	*Cost (%)*	
# of containers handled/month	400,000	383,333	350,000	1,200,000	1,500,000	550,000	295,105	560,000	1,000,000	150,000	760,000	350,000	850,000	550,000	8,916,438	637,031		
% beer containers	70%	30%	50%	50%	40%	40%	50%	40%	52%	25%	50%	30%	25%	30%		42%		
# beer containers	280,000	115,000	175,000	600,000	600,000	220,000	147,553	224,000	520,000	37,500	390,000	105,000	212,500	165,000	3,791,553	270,825		
% soda containers	30%	70%	50%	50%	60%	60%	50%	60%	48%	75%	50%	70%	75%	70%		58%	-	
# soda containers	120 000	268,333	175,000	800 000	900,000	330 000	147,553	336,000	480 000	112,500	390,000	245,000	837,500	385 000	5,126,886	386,206		
MONTHLY HANDLING COSTS AT CENTERS																		
Building Costs																		
Building Size (square feet)	3,000	20,000	8,000	9,000	5,500	2,400	2,000	7,800	12,000	1,040	4,500	15,000	9,000	3,500		7,317		
Area devoted to container handling	100%	10%	69%	72%	61%	95%	100%	100%	99%	100%	100%	100%	100%	99%		88%		
Area devoted to sorting	10%	5%	19%	39%	27%	28%		20%	15%	38%	56%	70%	15%	62%		29%		
Area devoted to storage	90%	5%	50%	33%	64%	07%		80%	84%	62%	44%	30%	85%	37%		52%		
Area devoted to product sales	NA	90%	31%	28%	9%	5%			1%		NA	NA	NA	1%		12%		
Lease or own	Lease	Own	Lease	Lease	Own	Own	Lease	Lease	Own	Lease	Own	Lease	Lease	Lease				
Lease or mortgage payment	1,200	700	828	2,880	3,840	1,045	667	1,000	1,436	1,000	5,600	*Donated*	2,000	1,305	23,300	1,664		
Electricity cost	150	250	124	NA	218	253	Included	500	392	30	245	Included	140	119	2,421	173		
Heating costs/month	200	150	52	72	228	Included	83	250	Included	50	250	Included	200	99	1,633	117		
Water and sewer costs/month	50	200	Included	Included	91	Included	50	450	Included		100	Included	Included	Included	941	67		
Property taxes	NA	NA	NA	Included	91	174	NA	725	474		1,333	Included			2,796	200		
Personal property or other taxes	NA	NA	NA	36	NA	150	123	100	NA						410	29		
Other building related costs																		
Alarm systems	30	200	69	72	32			125		20	25	Included	54	15	642	46		
Repairs	NA	83	86	0	152	48		333	85	17	25	Included	275		1,104	79		
Subtotal	*$1,830*	*$1,583*	*$1,158*	*$3,060*	$4,452	$1,070	*$923*	*$3,483*	$2,387	*$1,117*	*$7,578*	$0	$2,669	$1,538	$33,248	$2,375	16%	15%
Cost Per Container	*0.0041*	0.0041	0.0033	0.0026	0.0030	0.0030	*0.0031*	*0.0062*	0.0024	0.0074	*0.0097*	*0.0000*	*0.0031*	*0.0028*	0.0037	0.0039		
Equipment Costs																		
Moving equipment																		
Forklift (6-8 years)	350			287		450	93	74			211	78	50		1,601	114		
Truck			310	42		832	105	287							1,582	113		
Pallet Jack(s) - Electric (5 - 8 yrs)					37	4			200						241	17		
Pallet Jack(s) - Hand (5 - 8 yrs)	8	8		12		10		8			11	17	7	8	89	6		
Storage trailer, other		50				38	25					17			130	9		
Stationary Equipment																		
Office equipment (3-5 yrs)	0	14	0	10	38	28	14	108	200		8	33	187	7	633	45		
Computer	28	17	0	10		56		139			50	42	above	92	432	31		
Telephone costs per month	150	50	145	05	455	122	105	225		30	170	40	60	160	1,797	128		
Subtotal	*$542*	*$139*	*$481*	*$425*	*$530*	*$1,539*	*$342*	*$842*	*$400*	*$30*	*$451*	*$224*	*$304*	*$287*	$6,495	*$464*	3%	3%
Operating Costs																		
Administrative	325	430	400	2,400	200					20	420	2,216	3000		9,411	672		
Labor	3,262	4,730	4,800	9,000	13,850	5 500	3,002	4500	4208	1800	9 660	7,578	13 550	8,333	93,592	0.685	53%	
Overhead																		
Worker's Compensation	0	473	144	500	364	300	112	208	375	5	583	178	250		3,492	249		
Social security/Medicare Benefits	1,213	708 5	385	600	1,365	422			642	130	664	321	2 600		9 051	647		
State taxes	201				0	0									201	14		
Equipment Maintenance																		
Fuel costs	60	0		75	100	$263	cluded abo	300							798	57		
Maintenance	42	0		120		363	400	310				25			1,260	90		
Bags & Mother Cartons					3500							468			3,968	283	6%	
Plastic bags	430	215	518	300		393 75	171 8333	100	57	110	1,000		1,700	480	5,474	391		
Mother cartons from distributors	160	108	538	90		60		500	83		700		60	170	2,489	178		
Other cartons	240	0	0	Included		49	120			3 75	0		50	50	513	37		
Tape, Markers, Rope	42	Included	10	60		18	40.33333	200		13	17		25	20	445	32		
Shrink Wrap	30	86		60		0			129		167		60		552	39		
Other Costs																		
Office Supplies	30	10		20	0		45.25	250				100		20	475	34		
Employee supplies (gloves, eye/ear	84	30	20	130	0	8	114.0833	220	8	15	417	Included	200	50	1,296	93		
Pest extermination	30	25		50	100	28	25	290	8	10	100	In lease	40	30	736	53		
Waste Disposal	100	150	157	150	450	40	0	85	229	125	300	In lease	230	100	2,118	151		
Liability/Fire Insurance	100	167	86	0	150	1300	48.41667		136	33	117	56	100		2,293	164		
Accounting Costs	142	21	40	300	200	103	145.4167			100	500	1,226	1,333	50	4,160	297		
Payroll costs	NA	43	35	75	50						75	329	60		667	48		
MA & Federal Income Tax for corp	450	0	26	0	0	0									476	34		
Advertising, Misc	72	0	0	40	40	0									152	11		
Subtotal	57,053	$7,197	$7,156	$13,990	$20,189	$8,847	$4,225	$6,963	$5,875	$2,365	$14,719	$12,494	$23,258	$9,303	143,015	$10,256	64%	
Total Monthly Costs	$9,225	$8,619	$8,778	$17,478	$25,161	$12,056	$6,489	$11,288	$8,662	$3,512	$22,748	$12,718	$26,231	$11,108	183,358	$13,097	83.7%	
Handling Costs Per Container:	0.023	0.023	0.025	0.015	0.017	0.022	0.019	0.020	0.009	0.023	0.029	0.036	0.031	0.020	0.0206	0.02229	-	
MONTHLY TRANSPORTATION COSTS															4,828,976	402,415		
# of soda containers delivered	300	26 833	NA	90,000	900,000	33 000	116,042	235,200	96,000	3 375	312,000	81,250	274 125	NA	2,150,125	179,177		
# of beer containers delivered	280,000	115,000	NA	90,000	600,000	165,000	147,553	212,800	494,000	25,125	390,000	89,250	70,125	NA	2,678,853	223,238		
Truck costs																		
Capital costs	1,039	304		804	291	623	826	287	10500	111	833	423	440	112	10,893	1,284		
Maintenance Costs	0	167		Included	333	Included	250	$1,020			Included		300	40	2,110	162		
Insurance and inspection	0	208		Included	683	Included	449	Included			Included				1,340	103		
Fuel, other	172	108		Included	600	Included	150	Included		5	Included		250	90	1,375	106		
Storage trailer, other					1,100			Included			735	309			2,144	165		
Labor Costs	550	344		396	2,500	306 9	334	500	650	60	1,680	413	1,350	500	9,584	737		
Total Monthly Transport Costs:	$1,762	$1,131	$0	$1,200	$8,507	$630	$2,108	$1,807	$11,150	$176	$3,248	$1,145	$2,340	$742	33,346	2,557	16.3%	
Cost Per Container Transported	0.006	0.008	NA	0.007	0.004	0.005	0.008	0.004	0.019	0.006	0.005	0.008	0.007	NA	0.0069	0.0071		
Total Monthly Transport and Handl	$10,987	$10,050	$8,776	$18,676	$30,658	$12,986	$7,667	$13,096	$19,812	$3,688	$25,996	$13,864	$28,671	$11,846	$216,605	$15,654	100%	
Cost Per Container Handled:	0.027	0.026	0.025	0.016	0.020	0.024	0.026	0.023	0.020	0.025	0.033	0.040	0.034	0.022	0.0243	0.0257		

APPENDIX C

Summary of Consumer Survey Responses at Redemption Centers and Reverse Vending Machine Consumer Survey Results

SUMMARY OF CONSUMER SURVEYS

	REDEMPTION CENTERS SURVEYED						
Redemption Center Number	***2***	***4***	***5***	***7***	***8***	***11***	**Total**
Location	*Urban*	*Suburban*	*Urban*	*Suburban*	*Urban*	*Urban*	**Surveys**
Total Customers	*48*	*40*	*65*	*21*	*30*	*127*	**331**
Non-english speaking	*4*	*0*	*20*	*0*	*4*	*19*	**47**
Refused to participate	*12*	*0*	*15*	*3*	*1*	*21*	**52**
Skipped or missed	*8*	*0*	*10*	*5*	*8*	*35*	**66**
Number of Survey Participants	**24**	**40**	**20**	**13**	**17**	**52**	**166**
Date of Survey	2/24/1999	2/27/1999	2/10/1999	2/17/1999	2/17/1999	2/16/1999	
Hours of Survey	11:00 - 3:30	9:00 - 2:00	11:30 - 5:30	1:00 - 5:00	9:00 - 12:30	9:00 - 5:00	
Average # customers per week (1)	900	600	625	500	475	250	**3350**
Hours open per week	48	71	74	52	46	52	

Percentage of weekly customers surveyed: **5.0%**

(1) As reported by redemption center owner.

SUMMARY OF CONSUMER SURVEY RESPONSES AT REDEMPTION CENTERS

	Total Responses	Percentage (%)
Number of Survey Participants	166	NA
What are the reasons that you use a redemption center instead of a retail store to return deposit containers?		
Can drop off all brands	71	18%
Accept larger quantities of containers than retail	62	16%
Easy to unload containers from vehicle	25	6%
Staff more flexible as to how containers are delivered	44	11%
Closer to home	17	4%
Other factors, please list	91	23%
next to workplace	4	1%
easier, no hassle, faster, more convenient	73	18%
convenient for special needs person	2	1%
beer bottle return	5	1%
environmentally conscious	1	0%
What would you do with your returnable containers if this redemption center were not in operation?		
Return at supermarket	48	25%
Return at convenience store	6	3%
Try to find another redemption center	82	42%
Throw containers away	18	9%
Put in recycling bin at home	11	6%
Not collect containers - leave them where you found them	2	1%
Other, please list	20	10%
nearby liquor store	5	3%
take to Maine	1	1%
give to someone	2	1%
What if no other redemption centers were in operation? What would you do with your containers?		
Return at supermarket	86	46%
Return at convenience store	10	5%
Throw containers away	32	17%
Put in recycling bin at home	33	18%
Not collect containers - leave them where you found them	4	2%
Other, please list	15	8%
nearby liquor store	4	2%
scrap yard	1	1%
donate to drives	1	1%
take them to Maine	1	1%
How far is the closest retail store to your home, in miles, that accepts redeemable containers?		
Average miles per respondent	2	
Average minutes per respondent	7	
How far is the closest redemption center from your home?		
Average miles per respondent	4	
Average minutes per respondent	13	
Did you walk or drive to the Redemption Center?		
Walked	11	7%
Drove	152	92%
Bicycle	2	1%

SUMMARY OF CONSUMER SURVEY RESPONSES AT REDEMPTION CENTERS

	Total Responses	Percentage (%)
Number of Survey Participants	166	NA
If you drove, how many miles out of your way did you drive?		
Average miles per respondent (out of way)	4	
Average minutes out of way per respondent	20	
Out of way		68%
Not out of way		32%
On average, how many times per month do you come to this redemption center?		
Average times/mo per respondent	4	
What other places do you redeem containers? Please list:		
'where I buy beer"	1	1%
'supermarket... convenience store"	24	25%
'no other places"	71	73%
'liquor store"	1	1%
Average containers redeemed per month		
Average containers per respondent	1,159	
Are the containers that you redeem all from your home?		
Yes	111	67%
No	54	33%
If not, where did you collect them from (Stress confidentiality)?		
'workplace"	16	22%
'rubbish cans"	13	18%
'school"	2	3%
'recycling bins"	1	1%
'friends... relatives"	21	29%
'roadsides/streets"	14	19%
Other	5	7%
How many of your returnable containers do you redeem at redemption centers instead of retail stores?		
All (100%)	145	94%
About 75%	3	2%
About 50%	4	3%
25% or less	3	2%
Would you still redeem containers at this location if it offered 4 cents/container instead of 5 cents?		
Yes	136	87%
No	21	13%
Have you ever used a reverse vending machine?		
Yes	93	58%
No	68	42%
If so, would you prefer use of a reverse vending machines over personal contact?		
Yes, if quicker & took everything	2	2%
No	89	97%
Sometimes	1	1%
Would you recycle these containers if they were not redeemable?		
Yes	114	72%
No	45	28%

REVERSE VENDING MACHINE CONSUMER SURVEY RESULTS

Location ID#	#1	#2	#3	#4	Total	% of Total Respondents
Number of Survey Participants	9	15	9	12	45	
Hours Surveyed	3	3	3	3	12	
Prefered method of returning redeemable containers:						
Reverse vending machine	8	15	5	9	37	86%
Retail store (grocery, convenience, liquor store)	0	0	1	3	4	9%
Redemption center	0	0	1	0	1	2%
None - Prefer no bottle bill	1	0	0	0	1	2%
		Total Number of Respondents			43	
Reasons you use reverse vending machine instead of redemption center (May list more than one.)						
No personal contact	0	0	0	1	1	1%
Cleaner atmosphere to return bottles and cans	1	2	0	0	3	4%
Shopping here anyway	4	4	1	7	16	22%
Closer to home	5	7	5	1	18	25%
Other factors, please list	7	7	3	1	18	25%
Quicker, easier, convenient	3	5	3	0	11	15%
Never been	0	1	0	0	1	1%
No lines	0	1	0	0	1	1%
Only one available	1	0	0	0	1	1%
I like them	0	2	0	0	2	3%
		Total Number of Respondents			72	
OR						
Reasons why you don't prefer a reverse vending machine? (Choose one.)						
Too slow	1	1	2	2	6	19%
Hard to use	0	3	0	0	3	9%
Don't get cash	0	0	0	0	0	0%
Other, please list	1	2	4	2	9	28%
Too many people, too long of a line	0	1	0	0	1	3%
Concerned about sanitary aspects (messy)	1	0	0	1	2	6%
Out of order sometimes	0	0	1	0	1	3%
Reject certain brands	0	0	1	1	2	6%
Not applicable	7	1	0	0	8	25%
		Total Number of Respondents			32	
If these reverse vending machines were not in operation, I would: (Choose one.)						
Return at another reverse vending machine	4	6	2	4	16	33%
Return at another retail store	2	1	2	4	9	19%
Return at redemption center	1	2	2	0	5	10%
Throw containers away	2	1	1	2	6	13%
Put in recycling bin at home	2	4	1	1	8	17%
Other, please list	0	0	1	1	2	4%
give them to clerk	0	0	1	0	1	2%
give to the homeless	0	0	0	1	1	2%
		Total Number of Respondents			48	
How many miles is the closest retail store to your home that accepts redeemable containers?						
Average number of miles by respondents	3.0	0.9	1.6	1.3		
If you drove to return containers, how many miles out of your way did you drive?						
Average number of miles by respondents	0	1	0	1.7	6	24%
Not out of the way (shopping, home, etc)	4	8	7	0	19	76%
		Total Number of Respondents			25	
On average, how often do you return containers?						
Average times per month	2.7	2.0	2.3	4.4		
On average, how much money do you get back when you redeem containers?						
Average $ per return	$2.94	$3.95	$2.82	$3.68		
Average Containers Per Month By Respondent	**159**	**161**	**131**	**326**		

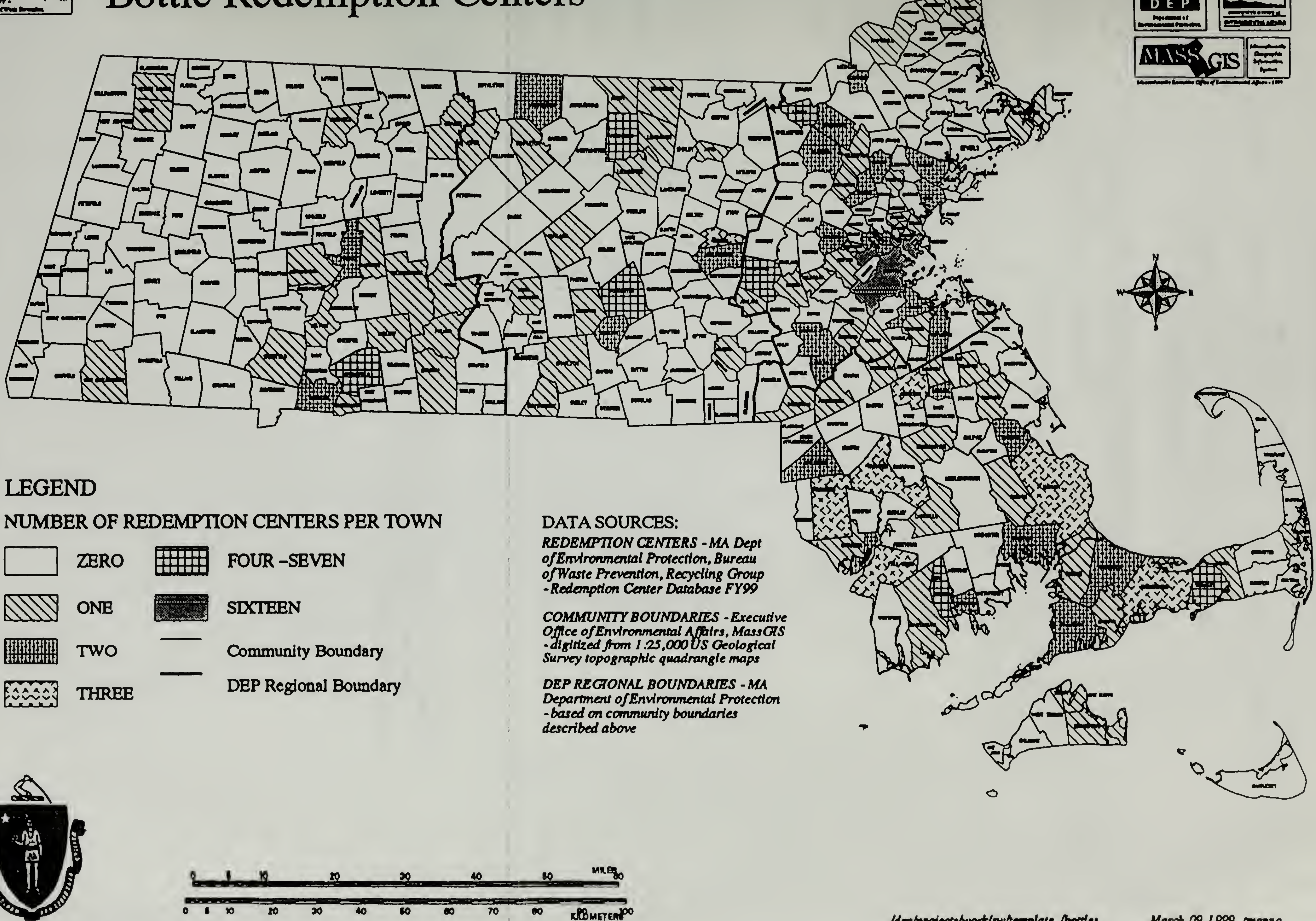
REVERSE VENDING MACHINE CONSUMER SURVEY RESULTS

Location ID#	#1	#2	#3	#4	Total	% of Total Respondents
Number of Survey Participants	9	15	9	12	45	
Hours Surveyed	3	3	3	3	12	
Are the containers that you redeem all from your home?						
Yes	7	13	9	10	39	93%
No	2	0	0	1	3	7%
		Total Number of Respondents			42	
If not, where did you collect them from (Stress confidentiality)?						
Collect at school	1	0	0	0	1	33%
Family/Friends/Neighbors	1	0	0	0	1	33%
Pick up on street from recycling bins	0	0	0	1	1	33%
		Total Number of Respondents			3	
How many of your returnable containers do you redeem at redemption centers instead of retail stores?						
All (100%)	8	12	8	7	35	88%
About 75%	0	0	0	1	1	3%
About 50%	0	0	0	1	1	3%
25% or less	0	0	0	2	2	5%
Takes big amounts from church to redemption centers	0	1	0	0	1	3%
		Total Number of Respondents			40	
Would you recycle these containers if they were not redeemable?						
Yes	6	10	5	8	29	67%
No	3	3	4	4	14	33%
		Total Number of Respondents			43	
Do the reverse vending machines that you use accept everything you bring?						
Yes	4	9	7	5	25	60%
No	5	3	2	7	17	40%
		Total Number of Respondents			42	
If not, what % of containers do they accept?						
90%	2	3	4	2	11	44%
80%	0	0	0	2	2	8%
70%	0	0	0	1	1	4%
60%	0	0	0	0	0	0%
Other	3	1	1	2	7	28%
< 10%	3	1	0	0	4	16%
		Total Number of Respondents			25	
What do you do with your rejected containers?						
Recycle	2	4	3	3	12	30%
Throw away	2	4	4	3	13	33%
Save for redemption center	0	0	1	2	3	8%
Other	2	2	0	2	6	15%
ask a clerk to credit the slip (leave them in a box)	1	0	0	0	1	3%
take to another store	1	0	0	0	1	3%
leave them for the store to recycle	0	2	0	0	2	5%
give to the homeless	0	0	0	1	1	3%
take to retail store	0	0	0	1	1	3%
		Total Number of Respondents			40	

APPENDIX D

Location of Bottle Redemption Centers in the Commonwealth

Bottle Redemption Centers



LEGEND

NUMBER OF REDEMPTION CENTERS PER TOWN

☐	ZERO
▧	ONE
▦	TWO
▨	THREE
▦	FOUR –SEVEN
■	SIXTEEN
—	Community Boundary
—	DEP Regional Boundary

DATA SOURCES:

REDEMPTION CENTERS - MA Dept of Environmental Protection, Bureau of Waste Prevention, Recycling Group - Redemption Center Database FY99

COMMUNITY BOUNDARIES - Executive Office of Environmental Affairs, MassGIS - digitized from 1:25,000 US Geological Survey topographic quadrangle maps

DEP REGIONAL BOUNDARIES - MA Department of Environmental Protection - based on community boundaries described above

/dep/projects/work/sw/template ./bottles

March 09, 1999 tmanno

APPENDIX E

Deposit and Handling Fees in Other Bottle Bill States

SUMMARY OF CONTAINER DEPOSIT AND HANDLING FEES IN OTHER BOTTLE BILL STATES

State	Year Bill Implemented	Container Deposit for 12 oz container (2)	Handling Fee	Escheat Provision
California (1)	1987	No consumer deposit (3) .	Segregated and Commingled Refund Value per Pound and Container (per Pound Rates)	No
Connecticut	1980	.05	.015 (beer) .02 (soft drink)	No
Delaware	1982	.05	20%	No
Iowa	1979	.05	.01	No
Maine	1978	.05	.03 (1989)	Yes, originally, but repealed in 1993
Massachusetts	1983	.05	.0225	Yes
Michigan	1976	.10	25% of escheat	Yes
New York	1983	.05	.02 in Dec. 98	No
Oregon	1972	.05	None	No
Vermont	1977	.05	.03	No
Columbia, Missouri	1982	.05	None	No

(1) Not technically a bottle bill.

(2) Larger sized containers may have a higher deposit.

(3) Distributors pay a per container fee of 2 cents <24 oz and 4 cents > 24 oz into state fund. Consumers do not pay a deposit but containers may be redeemed for 2.5 cents and 5 cents respectively.

(4) Source of information: DSM telephone interviews and Container Recycling Institute web page data.